

CHAPTER-II Arithmetic Expressions

Mind map:

Operations on Arithmetic Expressions

- * Addition
- * Subtraction
- * Multiplication
- * Division

Absolute Value of an Integer

Properties of Addition & Subtraction

- * Closure
- * Commutative
- * Associative
- * Additive Identity
- * Additive Inverse

Arithmetic Expressions

properties of Multiplication

- * Closure
- * Commutative
- * Associative
- * Multiplicative identity
- * Multiplication with 0
- * Distributive property

Simplification of Arithmetic Expression

properties of Division

- * closure property
- * Commutative property
- * Associative property
- * Division by one
- * Division by zero.

Arithmetic Expressions

An arithmetic expression is a combination of constants, variables, and arithmetic operators that represent a value.

Properties/ Operation	Addition	Subtraction	Multiplication	Division.
Closure Property	Integers are closed under addition. If a, b are any two integers, then $a+b$ is an integer.	Integers are closed under subtraction. $a-b$ is an integer.	Integers are closed under multiplication. $a \times b$ is an integer.	Integers are not closed under division. $a \div b$ is not an integer.
Commutative Property	Addition is commutative for integers. $a+b = b+a$	Subtraction is not commutative for integers. $a-b \neq b-a$	Multiplication is commutative for integers. $a \times b = b \times a$	Division is not commutative for integers. $a \div b \neq b \div a$
Associative Property	Addition is associative for integers. $(a+b)+c = a+(b+c)$	Subtraction is not associative for integers. $(a-b)-c \neq a-(b-c)$	Multiplication is associative for integers. $(a \times b) \times c = a \times (b \times c)$	Division is not associative for integers. $(a \div b) \div c \neq a \div (b \div c)$

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Distributive property of multiplication of integers over addition & subtraction:-

$$a \times (b+c) = (a \times b) + (a \times c)$$

$$a \times (b-c) = (a \times b) - (a \times c)$$

- * 0 is the additive identity for integers
 $a+0 = 0+a = a$.
- * $-a$ is the additive inverse of a .
- * 1 is the multiplicative identity for integers.
- * If 'a' is a non-zero integer, then its multiplicative inverse (or) reciprocal is $\frac{1}{a}$ then $a \times \frac{1}{a} = \frac{1}{a} \times a = 1$.
- * Division by 0 is not defined. Thus $a \div 0$ is not meaningful.
- * Division by 1 is the integer itself. Thus $a \div 1 = a$.

Simplification of Arithmetic Expressions:-

When an expression involves 2 or more mathematical operations & if brackets are present then the simplification begins with the innermost brackets, following the BODMAS Rule:

Brackets $\rightarrow$ Order $\rightarrow$ Division $\rightarrow$ Multiplication $\rightarrow$ Addition $\rightarrow$ Subtraction.

Absolute Value of an Integer:-

Absolute Value of an integer is the numerical value of the integer regardless of its sign.

If a is any integer, then $|a| = a$ & $|-a| = a$.

Eg:- 1. $|-6| = 6$;

2. $-|-7| = -(7) = -7$

3. $-|5| + |-5| = -(5) + 5 = 0$.

NCERT FOLDER

VSA : Q 2, (i), (ii), 3, 4, 5, 6, 7, 8, 9, 1 (iii & iv)

SA : Q. 1, 2 (i, ii, iv), 3, 4, 5, 6, 8, 9, 10.

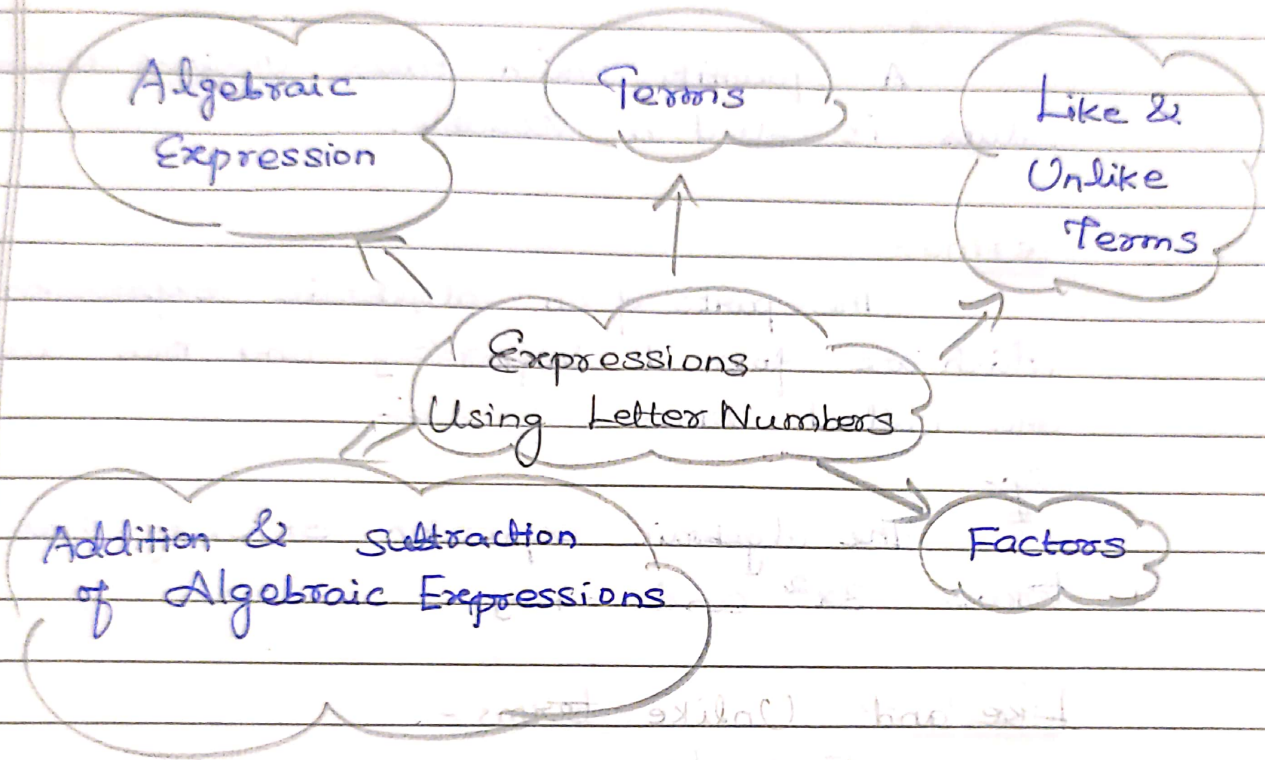
LA : Q. 1 (i & ii), 2, (i), (ii), 4, 5, 7, 8.

Subjective Questions : 7, 13.

Integer type Questions : 20, 22, 23, 24.

Chapter - IV - Expressions using Letter-Numbers.

Mind map:-



Algebraic Expression:-

The expression Consists of Constants and variables Connected by the Operations $+$, $-$, $\times$ and $\div$ is called an Algebraic expression.

Eg:- $3x$, $2x+3y$, $2-5y^2$

Constant:-

A quantity which has a fixed numerical value is called a constant.

Eg:- 25, -7, -8, 11 etc.

Variable:-

A quantity which takes various numerical values is called a variable.

Terms:-

The parts of an algebraic expression which are formed separately and then added are called terms.

Eg:-

The algebraic expression $3x^2 - 4xy$ has two terms $3x^2$ and $-4xy$.

Factor:-

Each term of an algebraic expression is a product of one or more constants and variables. These constants and variables are known as the factors of that term.

Numerical Factor:-

A constant factor is known as numerical factor.

Literal Factor:-

A variable factor is known as literal factor.

Expression:

$$a^2 + 2ab + 3b^2 - c$$

Terms:

$$a^2$$

$$2ab$$

$$3b^2$$

$$-c$$

Factors:

$$a \quad a$$

$$2 \quad a \quad b$$

$$3 \quad b \quad b$$

$$-1 \quad c$$

Constant term:

A term of an expression having no variable factor is called a constant term.

Eg:- In the algebraic expression $x^2 + 4xy - 8$, the constant term is -8 .

Coefficient:

In an algebraic term, the numerical factor is said to be the coefficient.

It is also the coefficient of the rest of the term.

Eg:- In the term $6xy$, 6 is the coefficient of the term. It is also the coefficient of xy .

Like & Unlike terms:-

When terms have the same algebraic factors they are called like terms.

When terms have different algebraic factors, they are called unlike terms.

Eg:- In the expressions $5ab - 3ac + 2ab - 7c$,

* $5ab$ & $2ab$ are like terms

* $-3ac$ & $-7c$ are unlike terms.

Types of Algebraic Expression:

Types	Monomial	Binomial	Trinomial	Quadrinomial
No. of Term	1-term	2-term	3-term	4-term
Example	$-7x^5$	x^3+9	$6x^5+y-9$	$a^4+b^4+c^5+d$

Addition of Algebraic Expressions:

To find the Sum of algebraic expressions like terms are collected together and added.

Eg $5x+3y+7x-12y = (5x+7x) + (3y-12y)$
 $= 12x + (-9y)$

$5x+3y+7x-12y = 12x-9y.$

Subtraction of Algebraic Expressions:

To subtract an algebraic expression from one another, change the sign (from + to - & - to +) of each term of the expression to be subtracted & then add.

Eg ① $5x-9x = (5-9)x = -4x$ [Horizontal Method]

② Subtract $-2a+b$ from $5a+2b$

$$\begin{array}{r} 5a+2b \\ -2a+b \\ \hline \end{array}$$

[Column Method]

$(5+(-2))a + (2+(-1)b) = 7a-b$

Multiplication of Algebraic Expressions:-

$$* (+x) \times (+y) = (+xy)$$

$$* (+x) \times (-y) = (-xy)$$

$$* (-x) \times (-y) = (+xy)$$

$$* (-x) \times (+y) = (-xy)$$

$$* x^m \times x^n = x^{m+n}$$

$$* x^m \times y^m = (xy)^m$$

Division of Algebraic Expressions:-

* To Divide a Monomial by a Monomial

(i) Divide the numerical Coefficient

(ii) Divide the literal Coefficients.

(iii) Multiply the result

* To Divide a polynomial by a polynomial.

step1:- Arrange the polynomial in descending order to establish a long division format. Allocating space for absent words.

step2:- The initial term of the quotient is derived by dividing the leading term of the dividend by the leading term of the divisor.

step3:- Subsequently, multiply each term of the divisor by the initial term of the quotient and remove the resultant from the dividend.

step4:- Utilise the remaining as the new dividend and reiterate Steps 2 & 3.

step5:- Continue the previously mentioned method until the remainder is either zero or a polynomial of lower degree than that of the divisor.

Pick Patterns & Reveal Relationship:-
 Spot how a pattern grows, label the step by n , then write the n^{th} term (Use implicit multiplication like $3n$, $(n+1)(n+2)$).
 * Number Sequences (n^{th} term)
 * Matchstick patterns

Equations:-

A mathematical statement that indicates that the value of the LHS is equal to the value of the RHS is called an equation.

Kinds of Equations:-

- * Single Variable equation Eg:- $x+9=12$
- * Two Variables equation Eg:- $x+y=15$
- * Three variable equation Eg:- $x+y+z=-12$

Linear Equation:-

An equation in which the highest index of the variables present in one is called a linear equation.

Eg: $x+8=9$.

Solution of Linear Equation:-

- * Trial & Error method
- * Transposition
- * Cross multiplication.

The value of the variable in which satisfies the equation, ie) $LHS = RHS$ is called the solution of the equation.

Trial and Error Method:-

Finding the root or solution or true value of the given equation from its domain is called the Trial and Error method.

Transposition:-

Any term of an equation may be taken to the other side with a change in its sign. This process is called transposition.

Eg:- (i) $x - 5 = 7 \Rightarrow x = 7 + 5 \Rightarrow x = 12$

(ii) $x + 2 = 4 \Rightarrow x = 4 - 2 \Rightarrow x = 2$

(iii) $\frac{x}{7} = 5 \Rightarrow x = 5 \times 7 \Rightarrow x = 35$

(iv) $2x = 10 \Rightarrow x = \frac{10}{2} \Rightarrow x = 5$

Cross multiplication:-

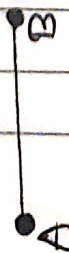
If $\frac{ax+b}{cx+d} = \frac{p}{q}$, then $q(ax+b) = p(cx+d)$

CH-5. Parallel and Intersecting Lines

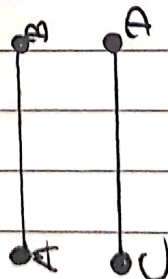
Parallel & Intersecting Lines

Lines

Line segment

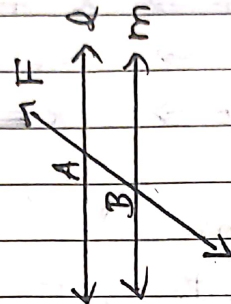


Congruent line segments



$$\overline{AB} = \overline{CD}$$

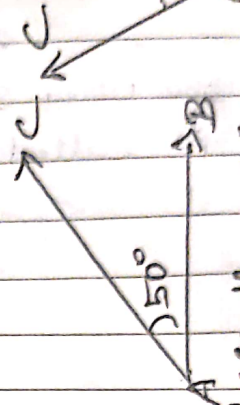
Transversal



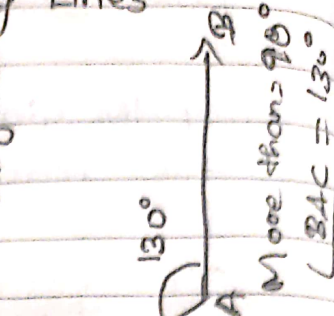
Angles

Types of Angles

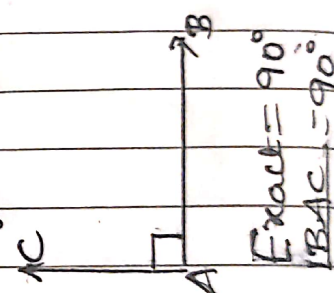
Acute Angles



Obtuse Angles

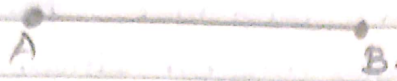


Right Angles

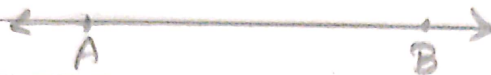


Line Segment:

A portion of a line with a finite length & two end points. Denoted by $\overline{AB}$.

Lines:-

A line segment $\overline{AB}$ when extended indefinitely in both the directions. It has no end point & no definite.

Point of Intersection:-

Two or more lines are said to be intersecting if they meet at a Common point. That common point is called the point of intersection.

Vertically opposite Angles:-

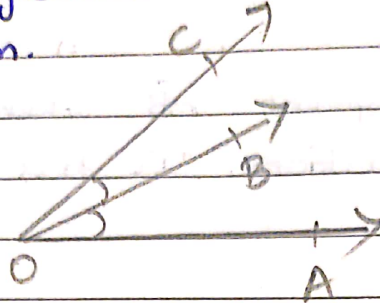
When two lines intersect, then two angles having no Common arm are called vertically opposite angles.

Measurement Geometry

Type of Angle	Measure
1. Acute Angle	Less than 90°
2. Right Angle	Exactly 90°
3. Obtuse Angle	Between 90° and 180°
4. Straight Angle	Exactly 180°
5. Reflex Angle	Between 180° and 360°
6. Complete Angle.	Exactly 360°
7. Complementary Angle	angle sum = 90°
8. Supplementary Angle	angle sum = 180°

Adjacent Angles:-

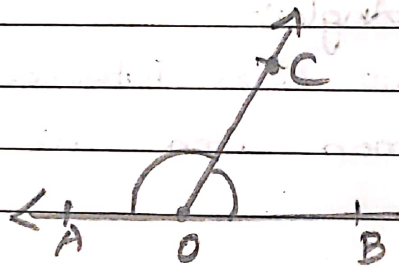
Two angles are said to be adjacent angles, if they have a common vertex and a common arm such that the other arms of the two angles are on either side of their common arm.



$\angle AOB$ & $\angle BOC$ are adjacent angles.

Linear Pair:-

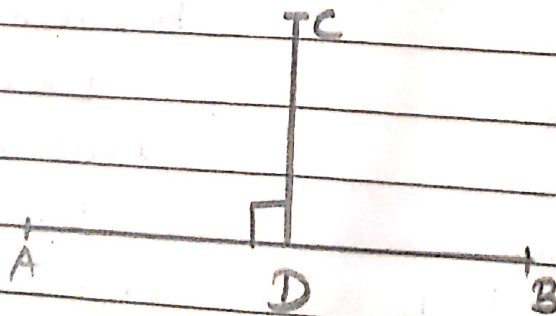
If the sum of two adjacent angles is 180° , they are said to form a linear pair.



$\angle AOC$ & $\angle BOC$ are linear pair ($\angle AOC + \angle BOC = 180^\circ$)

Perpendicular lines:

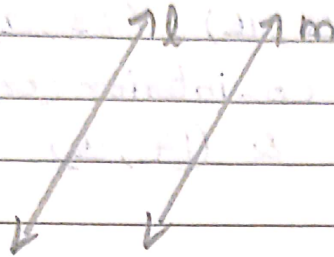
Two lines that intersect to form a right (90°) angle are called perpendicular lines.



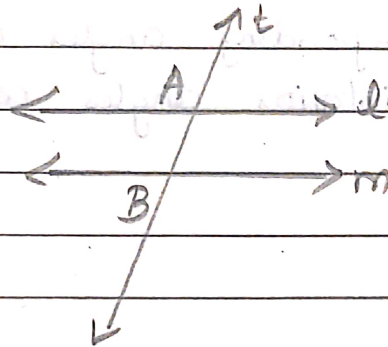
Line segment $\overline{AB}$ and $\overline{CD}$ are perpendicular.

Parallel Lines:-

If two lines are drawn in a plane such that they do not intersect, even when extended indefinitely in both directions, then such lines are called parallel lines. We write, $l \parallel m$ read as 'l' is parallel to 'm'.

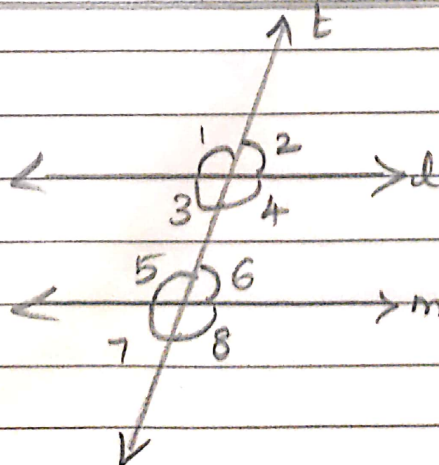
Transversal:-

A line that intersects two or more lines at distinct points is called a transversal.



A line 't' cuts two lines 'l' and 'm' at exactly two points A and B.

$\therefore$ t is a transversal.

Angles formed when a transversal cuts two lines.

Two pairs of alternate interior Angles:-
(13, 16) & (14, 15)

Two pairs of alternate exterior Angles:-
(11, 18) & (12, 17)

Four pairs of Corresponding Angles:-
(11, 15), (12, 16), (13, 17) & (14, 18)

Two pairs of Co-interior (or) Co-joined or Allied angles:-
(13, 15) & (14, 16)

In a transversal,

- * Alternate interior angles are equal.
- * Alternate Exterior angles are equal.
- * Corresponding angles are equal.
- * Co-interior angles are supplementary.